ORIGIN, ORGANIZATION AND SCOPE OF THE EXPEDITION.

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WITH FOUR PLATES.

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I. ORIGIN.

In April, 1922, Prof. H. C. Richards, D.Sc., of the Department of Geology, the University of Queensland, Brisbane, delivered an address entitled "Problems of the Great Barrier Reef" before the Royal Geographical Society of Australasia (Queensland), at Brisbane. Following upon this the President and Council of the Society decided to take steps to organize the investigation of this largest of all coral reef formations. The co-operation of the leading scientific societies and institutions in Australia and New Zealand and also of the British Museum was obtained, representatives were appointed by these bodies, and the Queensland co-operators then met and instituted the Great Barrier Reef Committee. The purpose of this Committee was the investigation of the origin, growth and natural resources of the Reef. The Rt. Hon. Sir Matthew Nathan, G.C.M.G., at that time Governor of Queensland and President of the Royal Geographical Society of Australasia (Queensland), was elected Chairman of the Committee, and Prof. Richards, Vice-Chairman and Honorary Secretary, and it is to these two gentlemen that the initiation and continued success of the Committee is primarily due.

It is not necessary here to discuss the early work of the Committee, the results of which will be found in the 'Reports of the Great Barrier Reef Committee,' vols. i and ii (1925, 1928). Much valuable physiographical and geological work was carried out, culminating in 1926 in the sinking of a bore to a depth of 600 ft. on Michaelmas Cay, a small coral formation on the southern side of Trinity Opening, opposite Cairns.

The Committee felt keenly the need for undertaking marine biological work, but were greatly hampered by the absence of trained workers in this branch of science and by

the lack of the funds necessary for carrying out work on the desired scale. Accordingly they requested Sir Matthew Nathan, who on his departure from Queensland had been made Patron of the Committee (Prof. Richards succeeding him as Chairman), to consult Prof. J. Stanley Gardiner, F.R.S., of the Zoological Laboratory, the University of Cambridge, about the possible despatch of an expedition from Great Britain. The outcome of this was that the Managers of the Balfour Fund of the University of Cambridge invited the author of this paper to become Balfour Student to carry out research on "The Feeding and Digestion of Invertebrates," especially, if possible, with reference to corals and other reef organisms.* A Great Barrier Reef Committee was formed and later reconstructed and enlarged at the Leeds Meeting of the British Association in 1927. It consisted of representatives of the sections of Zoology, Botany, Geography and Geology. Certain additional members were subsequently co-opted, the full list of members being as follows :

Rt. Hon. Sir M. Nathan, *Chairman* ; Prof. J. Stanley Gardiner and Mr. F. A. Potts, *Secretaries* ; Mr. E. Heron Allen, Dr. E. J. Allen, Prof. J. H. Ashworth, Dr. G. P. Bidder, Dr. R. N. Rudmose Brown, Dr. W. T. Calman, Sir G. Lenox Conyngham, Sir T. W. Edgeworth David, Mr. F. Debenham, Admiral Douglas, Capt. Edgell, Prof. F. E. Fritsch, Prof. E. J. Goddard, Prof. W. T. Gordon, Sir S. F. Harmer, Sir Frank Heath, Mr. A. R. Hinks, Dr. Margery Knight, Prof. H. C. Richards, Prof. A. C. Seward, Dr. Herbert Thomas, Dr. C. M. Yonge.

The Agent-General for Queensland, the Hon. John Huxham, kindly acted as Treasurer, and on his return to Queensland in 1929 was succeeded by the new Agent-General, the Hon. E. E. Macartney.

II. FINANCE.

The primary difficulties of the Committee were concerned with the raising of the necessary funds. These were eventually overcome and, as a result of the generous assistance of private individuals, scientific societies and, above all, of the Empire Marketing Board and the Australian Government, the following contributions towards the expenses of the expedition were raised :

Empire Marketing Board	£2500	
Australian Government	2500	
Great Barrier Reef Committee (Australia)	1000	
Royal Society of London (two contributions)	950	
Dr. G. P. Bidder	500	
British Association (two contributions)	400	
Australasian Association	200	
Mr. E. Heron Allen	100	
Mr. Edward T. Browne	100	
Dr. W. S. Colman	100	
Rt. Hon. Lord Glendyne	100	
Zoological Society of London	100	
Rt. Hon. Sir Matthew Nathan	25	
Mr. J. R. Eccles	5	5*s.*
Total	£8580	5*s.*

* This statement is inserted at the request of the Balfour Managers.

In addition to the above the Royal Geographical Society undertook financial responsibility for the Geographical Section of the Expedition; the Carnegie Trust for the Universities of Scotland by awarding Fellowships to Miss S. M. Marshall and Mr. A. P. Orr relieved the Committee of the greater part of the salaries paid to these two members of the expedition; the Balfour Fund of the University of Cambridge paid the expenses as well as the salary of their Student, and also gave special grants to Mr. F. S. Russell and Dr. S. M. Manton; the Australian and New Zealand Passenger Conference gave valuable concessions on the steamer fares, and provided four free return passages granted to expedition members by the Universities Bureau of the British Empire; the Orient Steamship Company carried the very bulky equipment at reduced rates; the Queensland Government provided free rail transport for members of the Expedition and equipment between Brisbane and Cairns (the total value of which approached £1000), and paid the salary of Mr. F. W. Moorhouse, one of the Australian members of the expedition; the Commonwealth Government further assisted by allowing all apparatus needed to be imported free of customs charges. The Chairman and Officers of the Committee were indefatigable in their work and themselves paid all the expenses so entailed; in particular Mr. F. A. Potts kept in touch with the expedition from its inception to its conclusion and was throughout of great assistance.

These funds and concessions enabled the full programme of the expedition to be completed and a small sum remained in hand after its return. The Trustees of the British Museum by generously undertaking the full publication of the results of the expedition complete the list of its benefactors and, by the magnitude of the expense so incurred, become also the greatest of them.

III. PERSONNEL.

The Committee was so fortunate as to obtain the services of a body of biologists, the majority of whom, although without previous experience of tropical conditions, had had considerable experience in research at the marine laboratories of Great Britain and elsewhere. On 26th May, 1928, a party of ten, consisting of Miss S. M. Marshall, Mr. A. P. Orr, Mr. G. W. Otter, Mr. and Mrs. F. S. Russell, Dr. and Mrs. T. A. Stephenson, Mr. G. Tandy and Dr. and Mrs. C. M. Yonge sailed from London on the R.M.S. "Ormonde." They arrived at Brisbane on 9th July and, together with the two Australian members, Mr. F. W. Moorhouse and Mr. A. G. Nicholls, at the headquarters, Low Isles, 1100 miles north of Brisbane, on 16th July. Subsequently additional members came out from Great Britain and some of the original members left, the camp being finally evacuated on 28th July, 1929, after being occupied for twelve and a half months. Full details of the entire *personnel* of the expedition, the nature of their work and the period they spent with the expedition are given below.

Biological Section.

J. S. Colman, B.A.	Oxford	Zoologist, zooplankton	10½ months.
Miss E. A. Fraser, D.Sc.	London	,, reef work	4 ,,
Miss S. M. Manton, M.A., Ph.D.	Cambridge	,, ,,	4 ,,
Miss S. M. Marshall, B.Sc.	Millport	,, phytoplankton	12½ ,,
F. W. Moorhouse, B.Sc.	Brisbane	Economic Zoologist	12½ ,,
A. G. Nicholls, B.Sc.	Perth, W.A.	Assistant to Physiologist	12½ ,,
A. P. Orr, M.A., B.Sc., A.I.C.	Millport	Chemist and Hydrographer.	12½ ,,

G. W. Otter, B.A.	Cambridge	Zoologist, reef work	11 months.
F. S. Russell, D.S.C., D.F.C., B.A.	Plymouth	,, zooplankton	5 ,,
Mrs. F. S. Russell, M.B.E.	Plymouth	Assistant to Mr. Russell	5 ,,
T. A. Stephenson, D.Sc.	London	Zoologist, reef work	11½ ,,
Mrs. T. A. Stephenson	London	Honorary Zoologist	11½ ,,
G. Tandy, B.A.	British Museum	Botanist	5 ,,
C. M. Yonge, D.Sc., Ph.D.	Cambridge	Physiologist	12½ ,,
Mrs. C. M. Yonge, M.B., Ch.B.	Cambridge	Medical Officer; assistant to Physiologist	12½ ,,

In addition, five members of the staff of the Australian Museum, Sydney, namely Mr. W. Boardman, Mr. T. Iredale, Mr. A. A. Livingstone, Mr. F. A. McNeill and Mr. G. P. Whitley spent periods varying between four and six weeks during 1928 assisting in the collecting work of the expedition. Mr. T. Iredale later spent a further period with the expedition, and his collections of reef molluscs and his wide knowledge of these animals were of exceptional service. Miss M. D. Glynne of the Rothamsted Experimental Station spent three weeks with the expedition during April, 1929, and did valuable work on the distribution of *Lithothamnion* on the reef and made collections of Lichens and Fungi.

Geographical Section.

This section was under the leadership of Mr. J. A. Steers, M.A. of St. Catherine's College, Cambridge, University Lecturer in Geomorphology, who himself only spent two very short periods on Low Isles. He was assisted by Mr. M. A. Spender, B.A. of Balliol College, Oxford, and, for a shorter period, by Mr. E. C. Marchant, B.A. of Cambridge. These gentlemen came on to Low Isles after the departure of Mr. Steers, Mr. Spender remaining there for the concluding 8 months of the expedition and Mr. Marchant for 1½ months.

IV. HEADQUARTERS.

After much consideration, the Barrier Reef Committee at Brisbane chose Low Isles as the headquarters of the expedition—an excellent decision, for they are within easy distance of the coast, near the Barrier, and possess a safe anchorage during the nine months of the south-easterly season. They consist of two small islands (Plate II, fig. 1) arising from a common coral formation and situated some 45 miles north of Cairns in lat. 16° 23′ S., long. 145° 34′ E. that is, about equidistant from either end of the Barrier. The coral formation from which they arise lies in the middle of the lagoon channel (in this area some 14 miles wide) between the Barrier and the mainland. As Low Isles Reef will be described in the greatest detail in the course of these reports, it is only necessary here to state that the islands consist of an uninhabitable mangrove swamp and of an oval sand cay about 185 yards long and 110 yards wide at high water (Plate IV, fig. 6). On the latter are situated a lighthouse and the houses of the three light-keepers, and on this small area also were built the living and laboratory huts of the expedition.

Mr. J. E. Young, a prominent Queensland naturalist with great experience in camp life who had volunteered his services in this capacity, was requested by the Australian Committee to superintend the erection of the huts, details as to the requirements of the party having been forwarded from England. On their arrival at Low Isles, therefore, the members of the Expedition found that all constructional work had been completed

and all necessary furnishings and stores provided. It was thus possible to begin scientific work almost immediately. The Expedition owes a great deal to the capacity and zeal of Mr. Young.

The huts were six in number, consisting of a laboratory and dining hut (Plate II, fig. 2) 35 ft. by 18½ ft., connected at one end with a kitchen 10 ft. by 12 ft.; a long hut (Plate III, fig. 3) 49 ft. by 12½ ft., divided into five rooms, one of which was used as a store and the rest occupied by the married members and single ladies; a second living hut 40 ft. by 12½ ft. divided into two rooms for the use of the remaining members of the expedition; a smaller hut similar in other respects to the last and used by the aboriginal servants; and a bathroom and lavatory. The last named, and the kitchen, were of galvanized iron throughout; the remainder were of wood with galvanized iron roofs. The two living huts had wide verandas. The huts were arranged in a row at the summit of the beach on the south side of the island, the bathroom being situated behind the living quarters.

An adequate supply of labour was obtained from the Anglican Mission to the Aboriginals at Yarrabah, near Cairns. There were, in succession, two half-caste women cooks, one for the first four months and the other for the remaining period. Both were married and their husbands were employed about the camp; two small children were brought by each of them. For work on the launch and for rough work about the camp two men, one a half-caste aboriginal and Melanesian and the other aboriginal and white, were employed. A third man was engaged for a short period to assist Dr. Stephenson. These servants were reasonably efficient, very willing, and by their cheapness enabled the expedition to complete its programme of work with the funds available.

Work about the camp was superintended by Mr. H. C. Vidgen of Brisbane, who also assisted on the boat. He remained for the entire period of the expedition, and his hard work, ingenuity and unfailing good humour contributed most materially to its success.

Mrs. Yonge acted as housekeeper in addition to her other duties, receiving in that capacity much assistance from the other lady members. Food and stores were obtained from Port Douglas, a small town on the coast directly opposite Low Isles and in tri-weekly communication with Cairns by sea and land. A lighthouse store boat came out once every fortnight, and the expedition launch, the "Luana," supplemented this in the alternate weeks.

The laboratory accommodation, though somewhat cramped in view of the large size of the party, proved adequate. The hut possessed eight windows, four on either side, and there were three doors, two centrally placed at the sides, and a third at one end connecting with the kitchen. The half further from the kitchen (Plate III, fig. 4) was occupied by three working benches, one on the south side occupied by the plankton workers, a central one used for chemical work, and a third on the north side used by the physiological party. In the other half there was a working bench along the south side used by the reef party, the north side being occupied by the dining table, on the wall behind which were the shelves containing the scientific library. As a result very largely of the generosity of scientific bodies and private individuals, a very useful working library had been collected before leaving England. All available space on the walls was occupied by shelves, and a special staging, sunk deep into the sand beneath the hut, was constructed for the centrifuge. A ceiling of white cloth reduced the heat transmitted through the galvanised iron roof and rendered the hut somewhat lighter.

A sea-water tank raised some 8 ft. from the ground by stout wooden supports had been constructed immediately outside the southern door of the laboratory. This was later boarded in beneath and used as an experimental aquarium, largely by the physiological party. Other aquaria were built for use by Dr. Stephenson and by Mr. Moorhouse. Water was pumped into these aquaria daily from the sea at high water by means of a hand pump. The wooden tank proved useless for its original purpose as a source of aquarium water, but became invaluable later by providing a head of water for circulation through the "Electrolux" refrigerator which helped to make life bearable during the summer months.

A small dark room was constructed by Mr. Young at the eastern end of the larger living hut, and later a small store for boat gear was added on the north side of the kitchen.

V. BOATS.

Communication with the mainland was maintained and regular boat stations carried out by the motor-launch "Luana." This boat was the property of Mr. A. C. Wishart, of Brisbane, who himself ran her, and whose generosity in providing his boat and services at a reasonable figure was a very important factor in the success of the expedition. The "Luana" (Plate IV, fig. 5) was a ketch-rigged yacht, 39 ft. long and with a 26 h.p. Kelvin sleeve-valve engine, extremely reliable and economical on fuel. She drew only 3 ft. of water, which was of advantage when approaching reefs. Although, naturally, never designed for marine biological work, she proved capable of adaptation for all the purposes for which she was required. Weekly boat stations were carried out with hardly a break throughout the year, and innumerable trips to Port Douglas, to Cairns and Yarrabah, to various places along the coast and to neighbouring reefs and islands, and once for sixteen days as far as Three Isles, 80 miles north of Low Isles, were successfully made. Mr. Vidgen assisted Mr. Wishart on the "Luana," and the two native men acted as crew, working the hand winch, etc. Full details of this side of the work will be given by Mr. Russell in his papers on the boat work.

The original policy of the expedition was to engage two launches. On arrival in North Queensland inquiries were made about boats, but without much success. Finally a 20-ft. whale boat with a 6-h.p. engine was purchased, for dredging and as an auxiliary to the "Luana." This boat gave unceasing trouble, both her hull and engine requiring extensive repairs. She carried out dredging and trawling work around Low Isles, but was otherwise of little use. Events showed that a second boat was unnecessary, and it is therefore fortunate that a larger and more expensive boat was not engaged as this would have reduced materially the funds available for boat work. A new 12-ft. dinghy and a $2\frac{1}{2}$ h.p. outboard motor for use with it were purchased and proved of great value, both for independent use around Low Isles and in co-operation with the "Luana" on trips to neighbouring reefs, etc. A small "flattie," originally used by the first Barrier Reef Expedition on Michaelmas Cay, was also useful, especially as a diving barge and a lighter.

As will be noted later, larger vessels were hired for extended cruises within and without the Barrier.

VI. SCIENTIFIC WORK.

A. Biological Section.—The expedition was divided into three parties, each with its own sphere of work, which it carried out largely independently of the other two. This policy worked well, the work of the three parties being such that they could co-operate with one another without overlapping.

1. *Boat Party.*—The work of this party was concerned essentially with plankton and hydrographic investigations, both in the lagoon channel between the Barrier and the mainland and over Low Isles reef. Mr. Russell was in charge of it until his departure in December, 1928, when he was succeeded by Mr. Orr. Mr. Russell personally carried out investigations on zooplankton, and was assisted in this, after his arrival in September, by Mr. Colman, who later continued his work. Mr. Orr did all hydrographic and chemical work and Miss Marshall worked on phytoplankton. In addition Mr. Orr and Miss Marshall did extensive work on sedimentation on Low Isles reef and the effect of this on the life of the corals. Miss Marshall also worked on the oxygen production by the zooxanthellæ in coral planulæ.

2. *Shore Party.* Dr. Stephenson was in charge of this party and, with the co-operation of Mr. Tandy, Mrs. Stephenson, Dr. Fraser and Dr. Manton, conducted detailed ecological surveys of Low Isles reef, Three Isles, and of sectors of the Outer Barrier. In this work they had the valuable assistance of Mr. Spender, whose surveys provided the necessary topographical background. On 24th September, 1928, the Royal Australian Air Force kindly sent from Bowen a flying boat which took a mosaic photograph of Low Isles reef from a height of 2000 ft. This photograph proved of the greatest assistance during the early stages of the survey and in the preparation of the maps later. Work on the breeding, development and growth of corals was conducted by Dr. Stephenson with some help from Dr. Manton, while Mrs. Stephenson, with assistance later from Dr. Fraser and Dr. Manton, worked on the breeding of a representative series of reef animals. Mr. Moorhouse assisted the shore party very greatly during the early months, but later devoted his full attention to problems of direct economic importance, such as the breeding and growth of *Trochus niloticus*, various holothurians (*bêche-de-mer*) and species of *Ostrea*, experiments on transplantation of *Euspongia* sp., and the accumulation of data regarding the nature, abundance and habits of the local food fishes. The results of this, and other economic work will be published in the 'Reports of the Great Barrier Reef Committee' in Australia.

3. *Physiological Party.*—This party was concerned primarily with the physiology of corals and was under the direction of Dr. Yonge, who had the assistance of Mrs. Yonge, Mr. Nicholls and Mr. Otter. Feeding, digestion, excretion and respiration of corals were studied, together with the influence and significance of the zooxanthellæ. Similar work was also done, on a smaller scale, on *Tridacna* and other reef molluscs. Mr. Nicholls investigated the breeding and growth of the black-lip pearl oyster, *Pinctada margaritifera*, and assisted Mr. Orr in work on calcium metabolism of corals. Mr. Otter worked on boring organisms, molluscan and gephyrean mainly, and their effect on coral rock, as well as assisting generally and doing photographical work. In addition to these activities, the Physiological Party, with the assistance of Mr. Moorhouse, were responsible for all dredging and trawling operations.

The original programme of the expedition, drawn up before leaving England and

without knowledge of the region where the work was to be undertaken or the conditions that prevailed there, was successively completed and also extended in many respects.

B. Geographical Section.— The work of this section consisted of a geographical reconnaissance in the M.L. " Tivoli " of Townsville, along the coast of Queensland from Whitsunday Island in the south to Flinders Islands in the north, during the months of September to November, 1928. Mr. Steers has published an account of the results of this cruise in ' The Geographical Journal,' vol. lxxiv, 1929. After his departure Mr. Spender and Mr. Marchant proceeded to Low Isles and worked in co-operation with the shore party to their mutual advantage. The purely geographical results of Mr. Spender's work are also to be published in ' The Geographical Journal.' The co-operation of the Royal Geographical Society was of the very greatest service to the expedition—a fact which is here most gratefully recognized.

Meteorological Observations.—By the courtesy of the Commonwealth Bureau of Meteorology, the expedition was supplied with a full set of standard meteorological instruments. A tropical meteorological hut, shown in Plate IV, fig. 7, was constructed, according to specifications supplied, on the north side of the sand cay. In it were housed the maximum and minimum and wet and dry bulb thermometers, the thermograph and the hydrograph. The barograph was kept in the lighthouse, as the firmest and best protected building on the island. These instruments were under the charge of Mr. Tandy, and, after his departure in December, of Mrs. Stephenson and Mr. Spender. The anemometer was erected above the sea-water tank and was read daily by Mr. Nicholls; the sunshine recorder, which was first placed at the top of the beach on the north side of the island and was thence transferred to the top of the sea-water tank, was attended to by Mrs. Yonge.

The Geographical Section brought with them an automatic recording tide gauge which, after much labour, was erected during February in the west side of the anchorage, three 30 ft. mangrove poles arranged in the form of a tripod providing the necessary support. Mr. Spender was in charge of this instrument. Twice daily, in the morning and evening, Mr. Moorhouse took the temperature of the water in the anchorage at the surface and at a depth of one metre, full details of which will be published.

Accurate daily information on air and sea temperatures, humidity, barometric pressure, direction and force of wind, sunshine and tides was thus secured.

VII. WORK AWAY FROM HEADQUARTERS.

It was early recognized that only after a thorough study of conditions on and around Low Isles could work be extended with profit further afield. Moreover good day low tides occurred only during the winter months, and by the time the shore party had made themselves acquainted with conditions on Low Isles reef, the tides were becoming too poor for extended reef cruises to yield results of any value.

It was clearly of the first importance, however, to investigate conditions over as wide an area as possible. The " Luana " was too small a boat to undertake long cruises with a large party and much gear on board, and larger and more powerfully engined boats, the " Magneta," " Merinda " and " Tivoli," all of Townsville, and the " Daintree," from the Daintree River Settlement, were hired for cruises. For deep sea work a friction winch and a small motor were purchased, without which work of this type would have

been impossible. The map on Plate I shows the central region of the Barrier and the area worked intensively by the Expedition.

Details of the various scientific excursions made are given below :

I. 20.x.28. "Merinda." Boat party with Dr. Yonge, Mr. Moorhouse and Mr. Nicholls. Hydrographic and plankton work outside Trinity Opening.

II. 23–24.xi.28. "Merinda." Boat party with Dr. Yonge and Mr. Nicholls. Hydrographic, plankton and dredging work outside Trinity Opening.

III. 25.ii.29–2.iii.29. "Magneta." Boat party with Mr. Spender. Hydrographic and plankton work between Low Isles and Lizard Island both within and without the Barrier.

IV. 6–14.iii.29. "Magneta." Dr. Yonge, Mr. Moorhouse and Mr. Vidgen. Dredging and other bottom work between Low Isles and the Howick Group, 120 miles to the north, both within and without the Barrier.

V. 17 18.iii.29. "Magneta." Boat party with Mr. Moorhouse and Mr. Nicholls. Plankton, hydrographic and dredging work outside Papuan Pass.

VI. 19–30.iv.29. S.S. "Cape Leeuwin." Mr. Orr and Mr. Otter proceeded on this vessel, by courtesy of the Commonwealth Lighthouse Service, to Willis Island and back, water-bottle samples being taken.

VII. 23.iv.29 27.v.29. A party consisting of Dr. and Mrs. Yonge, Mr. Moorhouse and Mr. Nicholls visited the Torres Strait during this period. The purpose of the visit was largely economic. The pearling and other marine industries centred on Thursday Island were inspected, also the work of Papuan Industries at Badu Island, and the various fishing activities at Murray Island, a fortnight being spent at the last named, the site of Dr. Mayor's expedition of 1913. The voyage from Cairns to Thursday Island and back was made on the S.S. "Taiping," and the other voyages on the Papuan Industries launch "Goodwill."

VIII. 1–16.v.29. "Luana." Dr. and Mrs. Stephenson, Mr. Colman, Mr. Spender and Mr. Iredale of the Australian Museum. Ecological and topographical survey of Three Isles, 80 miles north of Low Isles.

IX. 31.v.29–13.vi.29. "Tivoli." Dr. and Mrs. Stephenson, Dr. Fraser, Dr. Manton and Mr. Spender. A camp was established on Lizard Island and surveys made of neighbouring sectors of the Outer Barrier.

X. 5–6.vi.29. "Luana." Dr. and Mrs. Yonge, Miss Marshall, Mr. Orr, Mr. Moorhouse and Mr. Colman. Michaelmas Cay and Pixie Reef examined during exceptionally low day spring tides.

XI. 5–8.vii.29. "Daintree." Dr. Yonge, Mr. Orr, Mr. Moorhouse, Dr. Manton, Mr. Nicholls, Mr. Colman and Mr. Spender. Ruby and Escape Reefs of the Outer Barrier, respectively north and south of Papuan Pass, and Undine Reef of the Inner Barrier, visited.

XII. 2–5.viii.29. "Athlone." A party consisting of Miss Marshall, Mr. Orr and Dr. and Mrs. Yonge engaged this boat at Gladstone for the purpose of visiting the Capricorn Islands. Three nights were spent on Heron Island, the reef and turtle factory being examined, and a cruise made around the other islands, some time being spent on the reef at Northwest Island.

Full details of the plankton and hydrographic stations will be provided in the reports of the boat party.

In addition to the dredgings taken on these excursions very many hauls with the dredge and Agassiz trawl were taken on all sides of Low Isles from the whale boat, while an exhaustive series of bottom samples were taken by Mr. Orr. Bottom work in the lagoon channel between the Barrier and the mainland in the region about Low Isles was very disappointing in that the thick mud which practically everywhere formed the bottom

material was almost devoid of life. The only animals ever taken in any number were burrowing urchins of the genus *Maretia*, the Agassiz trawl once bringing in an estimated total of 20,000 in one haul. Only hard bottoms, such as that in Penguin Channel between Snapper Island and Cape Kimberly (about 10 miles from Low Isles) and shell gravel bottoms with rich growths of *Halimeda*, such as that around Lizard Island, proved rich dredging grounds. The quality of the bottom fishing naturally depended upon the quality of the bottom, being very poor around Low Isles and very good in the Lizard Island district. Owing to the paucity of the bottom fauna around Low Isles, little work was done with the grab. Several stations were taken outside the Barrier, but such work could only be done in dead calm weather and was very slow with the low-power apparatus at our disposal. Only with the aid of an ocean-going vessel and powerful gear could such work be properly carried out.

VIII. ACKNOWLEDGMENTS.

The indebtedness of the expedition to many individuals and bodies has already been recognized in the course of this narrative. Amongst the many others to whom thanks are due, special mention should be made of the Officers and Members of the Great Barrier Reef Committee, especially Prof. H. C. Richards, the Chairman, Dr. E. O. Marks, the Hon. Secretary, Mr. H. A. Longman, the Director of the Queensland Museum and the Deputy Chairman, Mr. W. M. L'Estrange, the Treasurer, and Miss H. F. Todd, the Assistant Secretary, whose efforts on behalf of the expedition were untiring; the Councils of the Scottish Marine Biological Association and of the Marine Biological Association of the United Kingdom for providing the necessary leave of absence for Miss S. M. Marshall and Mr. A. P. Orr and for Mr. F. S. Russell, members of their respective staffs; the Trustees of the British Museum for providing leave of absence for Mr. G. Tandy and for the loan of tanks, jars, and much collecting gear; the Trustees of the Australian Museum, Sydney, for their kindness in providing the services of five members of the scientific staff; the Royal Australian Navy for the provision of charts and the loan of much valuable apparatus; the Royal Australian Air Force for taking the aerial photographs of Low Isles; the Commonwealth Lighthouse Service for assistance rendered by their vessels, S.S. "Cape York" and S.S. "Cape Leeuwin"; the University of Cambridge for the loan of microscopes and other apparatus; the University of Sydney for the loan of microscopes; the various light-keepers on Low Isles for much practical help; Mr. A. J. Moran, of the Strand Hotel, Cairns, for advice and assistance of all kinds; Capt. D. Moynahan, for piloting the "Daintree" during the cruise along the Outer Barrier; Mr. C. O'Leary, Protector of Aboriginals at Thursday Island, Mr. D. C. Harman, Managing Director of Papuan Industries, Ltd., and Mr. G. Agnew, Government Teacher and Administrator of Murray Island, all of whom rendered great assistance to the party who visited the Torres Strait; Mr. H. Friend, of Gladstone, for making arrangements for the visit to the Capricorn Islands; Mr. Watson Baker for the loan of a half-plate Watson camera and all accessories; and many institutions and individuals, notably the Royal Society and the Linnean Society of London, the British Museum, the Indian Museum, Calcutta, the Australian Museum, Sydney, the Carnegie Institution and the Smithsonian Institution, both of Washington, and Prof. J. Stanley Gardiner, for the gift of books dealing with coral reefs and marine biology in general.

A most fitting conclusion to the work of the expedition was the formation by the Queensland Government of a permanent Marine Biological Service, having as its object the investigation and development of the products of the Great Barrier Reef and adjacent regions. Mr. F. W. Moorhouse has been put in charge of this work with the assistance of a junior naturalist. The huts on Low Isles, all equipment and the scientific library possessed by the expedition were handed over, and thus form the nucleus of the first Marine Laboratory established in Australia.

IX. COLLECTIONS.

The collections made on the Expedition will ultimately be deposited in the British Museum (Natural History), with the exception of a series of duplicates and some few type-specimens which are to remain in the Australian Museum, Sydney. Although the programme of work did not admit of much time being given to faunistic collecting, the very full ecological data accompanying the specimens give special value to the collections that were made.

DESCRIPTION OF PLATE I.

Sketch chart of the Great Barrier Reef from Flinders Islands to C. Grafton.

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DESCRIPTION OF PLATE II.

FIG. 1.—Low Isles from north-east; mangrove swamp on left, sand cay on right, coast in background.

FIG. 2. -Laboratory hut, northern aspect.

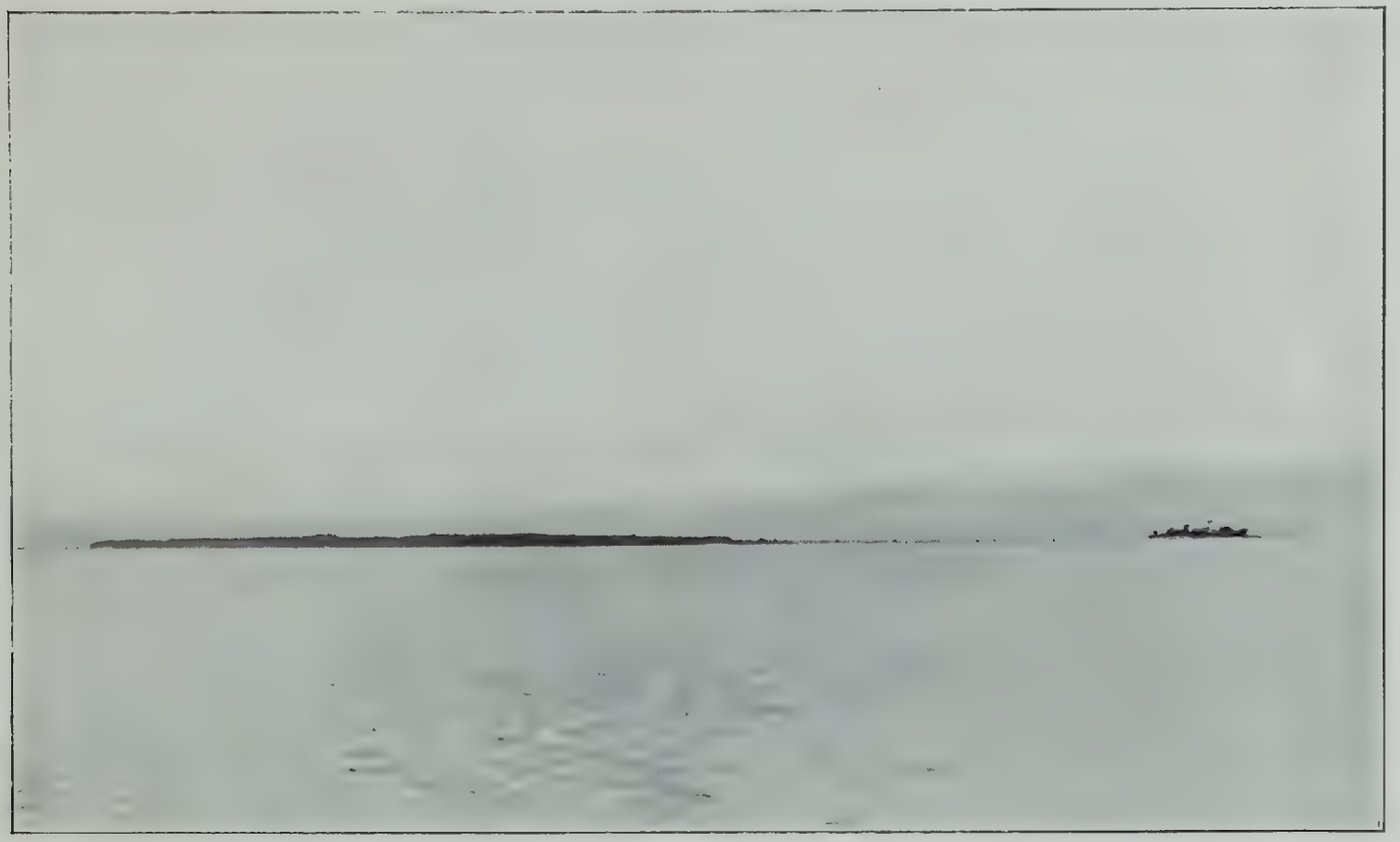

Photo M. J. Yonge.] FIG. 1.

Photo G. W. Otter.] FIG. 2. [*Adlard & Son, Ltd., Impr.*

DESCRIPTION OF PLATE III.

Fig. 3.—View along veranda of main living hut; second hut seen in distance.

Fig. 4. -Interior of laboratory, showing working benches, plankton bench on left, chemical bench in centre, physiological bench on right.

Photo M. J. Yonge.] FIG. 3.

Photo M. J. Yonge.] FIG. 4. [*Adlard & Son, Ltd., Impr.*

DESCRIPTION OF PLATE IV.

FIG. 5.—The M.L. "Luana" with dinghy in tow photographed at Snapper Island, Mr. A. C. Wishart standing against the mast.

FIG. 6.—Sand cay from south; lighthouse in centre, huts belonging to expedition seen above beach, laboratory and kitchen on right, living huts on left.

FIG. 7. -Meteorological hut.

Photo M. J. Yonge.] FIG. 5.

Photo M. J. Yonge] FIG. 6.

Photo M. J. Yonge.] FIG. 7.

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